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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/567,340	02/06/2006	Hiroyuki Fujimura	285304US0PCT	5321
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EXAMINER MILLER, MICHAEL G				
ART UNIT 1792		PAPER NUMBER		
NOTIFICATION DATE 03/25/2009		DELIVERY MODE ELECTRONIC		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/567,340

Applicant(s)

FUJIMURA ET AL.

Examiner

MICHAEL G. MILLER

Art Unit

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 January 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 6-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 6-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/CDC)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____
- Paper No(s)/Mail Date _____

DETAILED ACTION

Response to Amendment

1. Examiner notes the amendment filed 08 JAN 2009. The amendment introduces no new matter and is therefore accepted. As a result of the amendment, Claim 1 is amended, Claims 2-5 are canceled with various portions thereof amended into Claim 1, and Claims 6-14 are new.

Response to Arguments

2. Applicant's argument, see below, filed 08 JAN 2009, with respect to Claim 1 has been fully considered and is persuasive. The rejection of said claim has been withdrawn.
3. Applicant argues that Claim 5, which was amended into Claim 1, required the teachings of both Nishibayashi ('749) and Valone ('439) for its rejection, while Claim 1 as rejected only required Nishibayashi. Examiner agrees and withdraws the rejection of Claim 1.
4. Applicant's arguments filed 08 JAN 2009 with respect to Claim 1 as amended have been fully considered but they are not persuasive.
5. Applicant states that they have amended the subject matter of Claim 5 into Claim 1 and therefore presents arguments to show why Claim 1 as amended distinguishes over the prior art. Examiner notes that certain requirements from Claims 2-4 have also been amended into Claim 1 and will address them in this response.

6. Applicant's first argument is a piecemeal analysis of what the two references individually do not teach. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

7. Looking more closely at the list of individual non-teachings in the references, the only item that is listed on both of them in its entirety is the teaching of intended use ('a method of forming diamond film for electrodes used in an electrochemical process', item i of both teaching deficiency lists on page 7 of the remarks). If an item is capable of performing the intended use, it is a viable item to show obviousness. Applicant's remarks on page 8 indicate that '[e]mploying an insulating diamond layer could possibly render an electrode useless in an electrochemical application'. If the electrode could possibly be useless, it follows that it could also possibly be useful and therefore capable of fulfilling the intended use.

8. Applicant argues that neither of the cited references teach forming a diamond film for a specific intended use. This argument has been addressed above.

9. Applicant argues that neither of the films claimed are non-doped or low-doped diamond films. Examiner points out that the resistive properties of the films are never claimed.

10. Applicant argues that impurities are different from dopants and that the low quality diamond film as taught in the prior art does not include carbon impurities.

Examiner points to Column 4 Lines 7-19, where it is disclosed that silicon carbide can be incorporated into the diamond crystal structure. Silicon carbide contains amorphous carbon structures.

11. Applicant argues that the electrodes in the prior art are metal with diamond films attached to them. Examiner points out that the method claims a diamond film and not an electrode. The intended use of the film has been addressed above.

12. Applicant argues that Valone does not teach boron doping. Examiner points to Column 7 Lines 5-15 of Nishibayashi to show boron doping of diamond.

13. Applicant argues that Valone teaches away from a thickness of more than 5 microns. Examiner points out that the claims require a thickness of not less than 5 microns, which Valone encompasses at Column 4 Lines 48-62.

14. Applicant argues that the film of Valone is required to have carbon impurities, which would prevent it from being used as the second thin film. Examiner notes the portion of Valone cited (Column 4 Line 63 - Column 5 Line 4); the teaching indicates that a minor amount of graphite in the diamond crystal structure 'may be preferred'. Examiner takes the position that 'may be preferred' and 'must be included' are two radically different and non-overlapping terms.

15. Applicant argues that Valone teaches it is not easy to coat a graphite substrate with diamond. Examiner takes the position that as long as it is possible to do so, it does not need to be easy to do so in order to meet the claim limitations.

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

17. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

18. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

19. Claims 1, 6-10 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over '749/439.

20. Claim 1 – '749 teaches a method of forming a film of boron-doped diamond. The intended use is given no patentable weight beyond the fact that the film must be capable of being used for an electrode used in an electrolytic apparatus (see item 7 above). The method comprises

- a. Forming a first diamond film on a substrate by supplying a mixed gas of hydrogen, a boron source and methane, the methane being present at a concentration of 1-10% (Column 10 Lines 26-41)
- b. Forming a second and outermost diamond film on the first diamond film by supplying a mixed gas of hydrogen, a boron source and methane; (Column 9 Lines 33-45 and Column 4 Lines 45-58)
- c. Wherein
 - i. Each of the first diamond film and the second and outermost diamond film is formed by a hot filament CVD process or a microwave plasma CVD process (the citations above teach microwave plasma CVD);
 - ii. The first diamond film comprises a low-quality diamond having impurities of amorphous carbon or graphite (Column 4 Lines 7-19 discuss replacing parts of the active layers with silicon carbide, which contains amorphous carbon strictures);
 - iii. The first diamond film has a thickness of not less than 5 microns (cited above, 100 microns);

- iv. The second and outermost diamond film comprises a high-quality diamond film having substantially no impurities of amorphous carbon or graphite (cited above); and
 - v. The second and outermost diamond film has a thickness of not more than 1 micron (cited above, 0.1 microns).
- d. '749 does not teach the following limitation:
- vi. Wherein the methane concentration in the gas feed for the second film is not more than 0.3% (the above citation teaches 0.99%).
 - vii. '749 discloses the claimed invention except for the concentration of methane in the second film gas feed. It is well known in the art of CVD that the rate of gas feed is a result-effective variable with regards to the rate of deposition of a chemical layer (the more reactant gas present, the faster it can be deposited). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to adjust the methane concentration rate to control the deposition properties of the diamond film, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 220 F.2d 454, 105 USPQ 223 (CCPA 1955).
- e. '749 does not teach the following limitation:
- viii. Wherein the first diamond film is grown on a graphite substrate.

ix. '439 teaches that it is known to deposit diamond films on graphite substrates to form conductive composite materials, including diodes, using microwave plasma CVD methods (Column 3 Lines 40-58 and Column 5 Lines 36-38). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have combined the methods of '749 and '439 because '739 wants to deposit diamond films on substrates for use in diodes and '439 teaches that graphite substrates are known as acceptable substrates for this purpose.

21. Claim 6 – As discussed in Claim 1, the first film is formed at 100 microns thickness.

22. Claims 7 and 8 – The combination teaches all details of the claimed invention except for the rate of formation of the diamond films. It is known in the art of CVD that control of the film deposition rate leads to control of the physical properties of the deposited material, for example crystallinity. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to control the deposition rates to give a desired state of crystallinity to the final product, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 220 F.2d 454, 105 USPQ 223 (CCPA 1955).

23. Claim 9 - The combination teaches all details of the claimed invention except for the cycle time of the production method. It is known in manufacturing that cycle time is a result-effective variable with regards to production (the shorter the cycle time, the

more product you can make in a given time). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to control the cycle time to produce a desired amount of product, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 220 F.2d 454, 105 USPQ 223 (CCPA 1955).

24. Claim 10 – As discussed in Claim 1, the films are formed at 40 Torr, which is 5333 Pa.

25. Claim 13 – As discussed in Claim 1, the films are formed by microwave plasma CVD processes.

26. Claims 11-12 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over '749/'439 in view of Purdes (U.S. Patent 5,114,696, hereinafter '696).

27. Claim 11 – The combination teaches all details of the claimed invention except for the temperature of deposition. '696 teaches a method of depositing diamond films on a surface using a hot filament method where deposition occurs at a substrate temperature of 1000 degrees Celsius (Column 3 Line 9 - Column 4 Line 22) and teaches that the deposition may also occur using microwave CVD processes (Column 4 Lines 31—5). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have combined the methods of '749/'439 and '696, as '749/'439 want to deposit diamond films on a substrate using microwave CVD and '696 teaches that hot filament deposition is a known alternative to microwave CVD.

28. Claim 12 – '696 teaches hot filament deposition as discussed above.
29. Claim 14 – '696 teaches filament temperatures of 2000 degrees Celsius and teaches that substrates other than silicon may be used (Column 4 Lines 37-38); '439 as discussed above teaches that graphite substrates are suitable deposition targets for diamond films.

Conclusion

30. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL G. MILLER whose telephone number is (571)270-1861. The examiner can normally be reached on M-F 7-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on (571) 272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Michael G. Miller/
Examiner, Art Unit 1792

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